EFFICACY OF STRENGTHENING EXERCISES AND ENDURANCE EXERCISES FOR NECK MUSCLES IN REDUCING PAIN AND DISABILITY IN PATIENTS WITH MECHANICAL NECK PAIN - A COMPARATIVE STUDY.

Dissertation submitted to

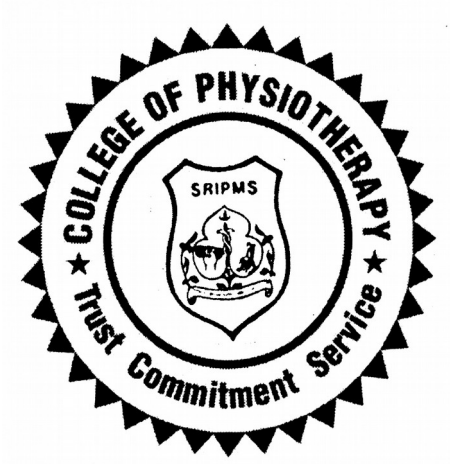
The Tamil Nadu Dr. M. G. R. Medical University

Chennai

In partial fulfillment of the requirements for the degree of

MASTER OF PHYSIOTHERAPY

(ADVANCED PHYSIOTHERAPY IN ORTHOPAEDICS)



EG . NO. 27101103

APRIL - 2012

COLLEGE OF PHYSIOTHERAPY

SRI RAMAKRISHNA INSTITUTE OF PARAMEDICAL SCIENCES

COIMBATORE - 641 044.

CERTIFICATE

This is to certify that the dissertation work entitled "**Efficacy of strengthening exercises and endurance exercises for neck muscles in reducing pain and disability in patients with mechanical neck pain – A Comparative Study"** was carried out by the candidate bearing the **Register No. 27101103 (April 2012)** in College of Physiotherapy, SRIPMS, Coimbatore, affiliated to The Tamilnadu Dr. M.G.R Medical University, Chennai towards partial fulfillment of the **Master of Physiotherapy** (Advanced Physiotherapy in Orthopaedics).

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CERTIFICATE

This is to certify that the dissertation work entitled **Efficacy of strengthening exercises and endurance exercises for neck muscles in reducing pain and disability in patients with mechanical neck pain – A Comparative Study"** was carried out in College of Physiotherapy, SRIPMS, Coimbatore, affiliated to The Tamilnadu Dr. M.G.R Medical University, Chennai towards partial fulfillment of the **Master of Physiotherapy** (Advanced Physiotherapy in Orthopaedics) under my direct supervision and guidance.

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APRIL -2012

To The Tamil Nadu Dr. M.G.R. Medical University, Chennai in Partial fulfillment of the requirement for the award of degree of **MASTER OF PHYSIOTHERAPY** was evaluated

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

Place : Coimbatore
Date :

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CONTENTS

1. INTRODUCTION

Neck pain is common condition of the cervical spine which occurs when there is a change in the normative physiologic and anatomic state. Pain is defined as a sensation characterized by a group of unpleasant perceptual and emotional experience that triggers autonomic, psychologic, and somatomotor responses associated with actual or potential damage to the tissues. Mechanical neck pain may be defined as pain secondary to overuse of normal anatomic structure or pain secondary to injury or deformity of anatomic structure. Neck pain is considered to be chronic if it lasts for more than 3 months of duration and pain that continues after the stimulus has removed or the tissue damage heals. Mechanical neck pain is becoming increasingly prevalent in society estimations indicated that 67% of individuals will suffer neck pain at some stage throughout life.

A sedentary life style is a major risk factor across the spectrum of preventable diseases that lower the quality of life. Sedentary life can lead to various problems like decrease muscle strength; decrease joint ROM and daily activities of individuals.

In past, principle treatment of neck pain has largely been pain reliving effect such as traction, soft tissue treatment and rest. The efficacy of different treatment modalities and with quite a few systemic reviews.

ANATOMY OF THE CERVICAL SPINE

The cervical column is made up of two anatomical and functional distinct segments;

The superior (or) sub occipital segment (1), containing the first vertebra (or) Atlas and second vertebra (or) Axis. These vertebrae are connected to each other and to the occiput by the complex chain of joints with three axis and three degree of freedom.

The inferior segment (2), Stretches from the inferior surface of the axis to the superior surface of T1.

The cervical vertebrae are all alike, except for the atlas and axis which differ from each other and from the remaining vertebrae.

The joint of the inferior segment have only two types of movements

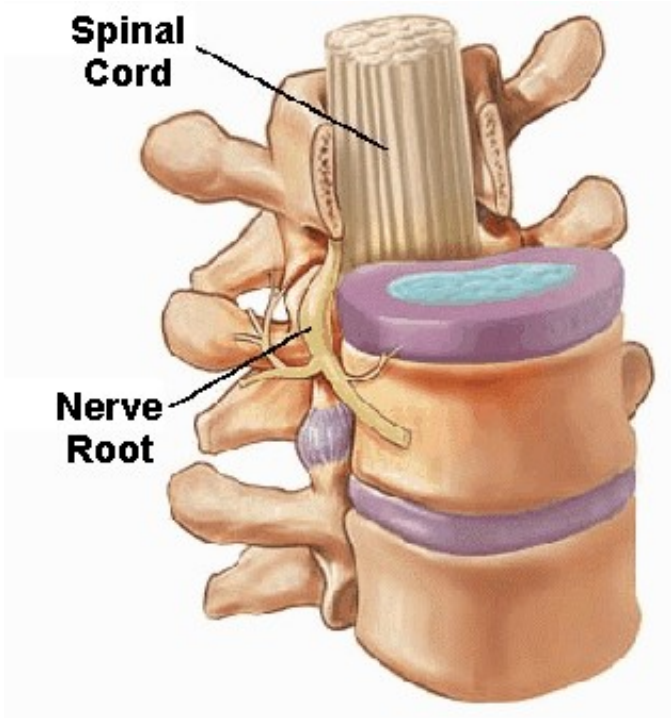
a. Flexion and Extension.
b. Lateral flexion with Rotation.

Functionally these two segments are complementary to allow pure movements of rotation, lateral flexion, and extension of head.

FACET JOINT:

The facets connect the bony arches of each of the vertebral bodies. There are two facets joints between each pair of vertebrae, one on each side. Facets joints connect each vertebra with the next vertebrae above and below. They are primarily designed to allow the vertebral bodies to rotate with respect to each other.

INTERVERTEBRAL DISC:



It is located in between each vertebrae and functions as a shock absorber and as joint; They are designed to absorb the stresses carried out by the spine while allowing the vertebral bodies to move with respect to each other. They are made up of strong outer ring of fibers called Annulus Fibrosis and the soft center called the Nucleus

Pulposus. The outer layer Annulus Fibrosis helps to keep the inner layer Nucleus Pulposus intact. The Annulus is made of very strong fibers that connect each vertebra together. The nucleus of the disc has a very high water content making is very moist.

LIGAMENT OF THE CERVICAL VERTEBRAL COLUMN:

The vertebral bodies are bordered front and back by two major ligaments.

The longitudinal ligament is broad, strong ligament of the anterior lateral aspect of the vertebral bodies from the atlas of the sacrum.

The posterior longitudinal ligament lies on the posterior surface of the bodies of the vertebrae from the axis to the sacrum.

Supraspinous and interspinous ligaments are present between adjacent spinous processes. The supraspinous ligament maintains the articulation between the vertebral bodies.

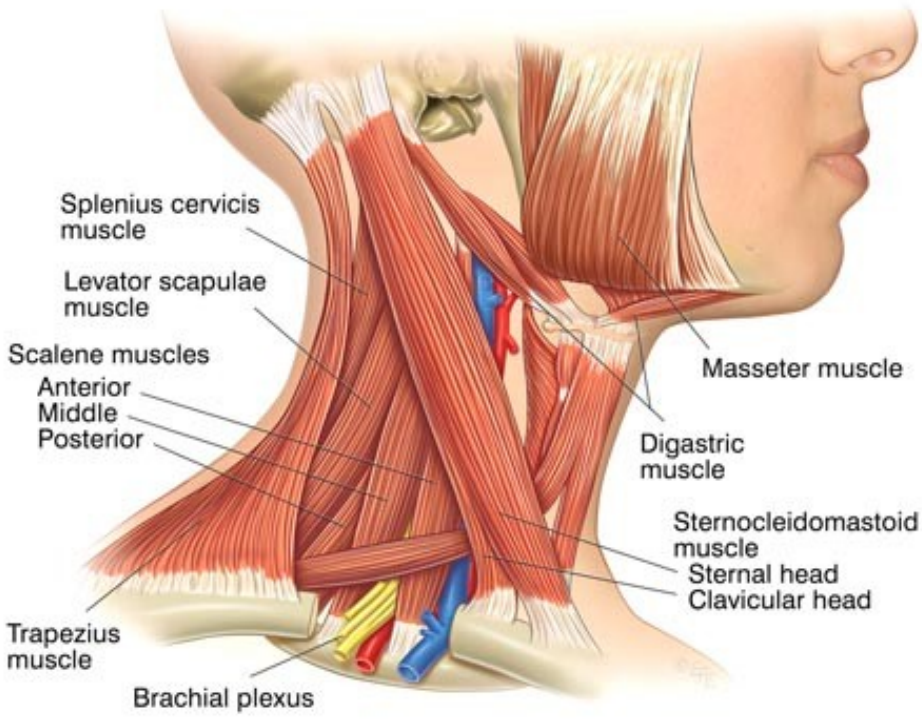
The supraspinous ligament is thin which is composed of high percentage of elastic tissue, and run over the tip of the Spinous processes. In humans this structures extends from the vertebrae prominence to the external occipital protuberance and it is probably a major stabilizer for head and neck.

BLOOD SUPPLY OF THE CERVICAL SPINE:

The vertebral artery is the major source of blood supply of the cervical spine and the cervical portion of the spinal cord. The vertebral arteries are usually the first and the largest branch of the subclavian on each side.

MUSCLES INVOLVED IN THE MOVEMENT OF THE CERVICAL SPINE:

MUSCLES OF NECK



Flexion of head at the atlanto occipital joint produced by the

- Rectus capitis anterior muscles
- Longus capitis

Flexion of the head at the lower cervical is carried by Longus colli.

Extension of the head at the atlanto occipital joint is produced by

- Rectus capitis posterior minor
- Rectus capitis posterior major
    - Oblique capitis superior
    - Semispinalis capitis
    - Splenius capitis
    - Splenius capitis

Lateral flexion of the head at the atlanto occipital joint is produced by

- Rectus capitis lateralis
- Semispinalis capitis
- Splenius capitis

Rotation at the atlanto occipital joint is produced by

- Oblique capitis superior
- Rectus capitis posterior minor
- Splenius capitis

The primary extensors of the head and neck are numerous, most of these muscles also capable of producing rotation. The cervical spine supports the head, proving attachment for muscles of the neck and upper extremity and long with the rest of spine protects the spinal cord.

BIOMECHANICS OF CERVICAL SPINE:

The normal function of the cervical spine requires both flexibility to move the head and endurance of the musculature. A basic understanding of the clinical relevant biomechanics of the cervical spine is necessary for making a complete assessment of the neck of the patients who have cervical problems.

The cervical spine is better suited for mobility and is not required to transfer heavy loads. They weighs only 5 to 7 pounds. All vital nerve centers are in the skull and allow coordination of vision, vestibular balance and auditory direction precise control of head position and movement is essential for normal functioning of those sense. The biomechanical studies involving the cervical spine have to concentrate on two major areas like clinical stability and kinematics. Stability as applies to the spine, which may be defined as the ability of the under physiologic loads of limit patters displacements.

The function of the cervical spine may be divided into two section, that of the upper segment above C3 and that of the lower segment from C3 to C7. Most of the axial rotation in upper cervical spine occurs at the atlantoaxial joint.

The articular surfaces are convex with the horizontal orientation, allowing for the maximum mobility Atlantoaxial rotation averages 47, which represents above 50% of the axial rotation in the

neck, with the lower cervical spine contributing the other 50% of rotation. There is also a 47° of axial rotation at the occiput cervical junction. The rotation of C2 and C3 is physically limited by the anatomic locking of the anterior tip of the articular process of C3 on the lateral process of axis. The lower cervical segment C3 to C7 foraminal opening for the spinal nerve roots that supply the upper extremities. Motion in the lower cervical spine includes flexion, extension, lateral flexion and rotation.

Flexion of the cervical spine is limited by the posterior longitudinal ligament, the posterior inter vertebral ligaments that attach to the transverse process, posterior superior spine and the limited elasticity of the fascia of the extensor musculature. Excessive extension is limited by direct contact of the vertebral laminae, zygapophyseal joints and posterosuperior spinous process.

Exercise is considered to be an essential component that has been shown to be beneficial in the treatment of neck pain.

As new training methods are emerging better understanding of the effects of such techniques on patients status is currently an important area of research. In the present society due to time factor only a few types of exercises can be prescribed for the patients, and which is most effective, time efficient and easy performable exercise protocol is to be suggested.

ROLE OF ISOMETRIC NECK MUSCLE STRENGTHENING EXERCISES

Strength refers to ability of muscle to produce force. The resultant force can be in the production of movement (isotonic contraction) or in the resistance to movement (isometric contraction).

Isometric exercise is a static from of exercise that occurs when a muscle contracts without appreciable change in the length of muscles are without visible joint motion. The stabilization program starts within the established pain free range of motion and is then applied outside the range of motion as the patient condition improves.

Cervical stabilization requires training and co-ordination of muscles in the neck area. According to Takala, MD Dmsd Sc all stabilization exercises improves neck pain.

ENDURANCE EXERCISE

The muscle response to endurance training is different from its response to strength training. Muscle endurance depends on oxidative capacity, and training increases muscle metabolic capacity. muscles trained for endurance demonstrates cells with increased mitochondrial size, number, and enzymatic activity allows the muscle to use the oxygen delivered better. Endurance muscle training improves the oxygen delivery system by increasing the local capacity network,

producing more capillaries per muscles fibre. Many whether at work, in the home or leisure require the ability to sustain movement for a period of time hence; endurance training is a necessary part of the rehabilitation program.

According to **Anneli peoisson** PhD PT training for neck muscle endurance has been shown as an important component in the rehabilitation process.

In the present society due to time factor, only a few types of exercises can be prescribed for the patient, and finally need is felt to find the most effective, time efficient and easy performable exercise protocol. This study may help to design such an exercise regime.

There is a lack of study comparing Stabilization exercise and Endurance exercise so, hereby I wish to compare two types of exercise.

NECK DISABILITY INDEX

Neck stability index questionnaire is used to measure the level of neck pain, which was modeled after the Oswestry questionnaire by Vernon and Mior in 1991. Similar to Oswestry, subjects choose the statement that best describes the situation in each of ten sections. The sections are concerned with impairment like pain intensity, personal care, lifting, sleeping, concentration, work, driving, sleeping, and recreation. Total score range from 0 to 50, where 0 is considered as highest level of function and 50 as lowest level of function.

1.1 NEED FOR STUDY

The use of isometric neck muscle strengthening exercises and endurance training in relieving pain and improving the functional ability, Still remains to be optimized and lacks the much needed standardization. Hence the study aims in contributing towards the effect of isometric neck muscle strengthening exercises and Endurance training in mechanical neck pain.

1.2 STATEMENT OF THE PROBLEM

The study is entitled as "Efficacy of strengthening exercises and endurance exercises for neck muscles in reducing pain and disability in patients with mechanical neck pain- A Comparative study."

1.3 OBJECTIVE OF STUDY

The study aims to evaluate the effect of isometric neck muscle strengthening exercises and endurance training exercise by

- To relieve pain
- To increase range of motion
- To improve functional ability in neck pain patients

1.4 HYPOTHESIS

In the background of ambiguous knowledge about the effects of isometric neck muscle strengthening exercises and endurance training in reducing pain and improving functional ability. It makes the research to be performed within the premises of null hypothesis which stated as follows.

Null Hypothesis

'There is no significant difference in the symptomatic recovery on using isometric neck muscle strengthening exercises and endurance training in patients with mechanical neck pain'.

2. REVIEW OF LITERATURE

NECK PAIN

- **Laurie la Russo,** MS in his study on "Neck pain and limited neck pain and limited function associated with complaints" states that current therapy includes pain relievers, postural or ergonomic changes, stretching and strengthening exercise, physical therapy and chiropractic care can include manual therapy, in which the practitioner performs hands-on muscular and joint mobilization and stabilization techniques.
- **Robert F.Mclain** (2001) Presence of mechanoreceptive and nociceptive nerve ending in joint capsules proves that these tissues are monitored by the central nervous system and implies that the neural input from the facets is important to proprioception and pain sensation in the cervical spine.
- **Cote** and **colleagues** (2000) stated that origin and pathophysiology mechanism of chronic neck pain due to excessive strain, may cause micro trauma in connective tissues and psycho-social stress may lead to increased muscular tension.

- **Beeton, Jull** (1994) stated that there is clinical evidence that the upper and deep cervical flexors, which are important muscles for cervical segment and postural control, lose their endurance capacity in patients with neck pain.
- **Janda** (1994) suggest that the cervical flexor muscles became dysfunctional in presence of neck pain and further demonstrated a reduction in the strength and endurance capabilities of cervical flexor muscles in neck pain patients.
- **Bernard M. Skler,** MD MS (2003) , both strength and endurance training are effectively decreasing pain and in women with chronic non specific neck pain. Stretching and aerobic exercises alone are much less effective than strength training.
- **Rudriuez**, MD et al (1992) reviewed research regarding the effect of exercise on chronic begin axial pain. Both chronic low back pain and chronic neck pain are associated with weakness of trunk and neck musculature; however, it is unknown whether weakness is cause or effect. The relationship between incoordination of neck or trunk musculature and chronic pain is unclear.

- According to **Angela Malis-Gagnon** MD, The review shows that it does not matter what kind of passive treatment one offers, it is what the patient does that really matters, and suggests that the role of all practitioners who offers hand-on treatments, is to make sure that the patient is guided through well designed exercise regimens.
- **Fiatarone** MA, et al – Did a study on exercise training and nutritional supplementation for frailty in elderly people and concluded that high intensity resistance exercise is a feasible and effective means of counteracting muscle weakness and physical frailty in elderly people. In contrast, multinutrient supplementation without concomitant exercise does not reduces muscles weakness or physical frailty.

ISOMETRIC EXERCISE

- **Gustawa Stending- Lindberg** (2004) stated that daily application of isometric exercise for six seconds only by using two thirds of maximal contractile force, results in an optimal increases of muscle strength.
- **Pekka Takala** (2006) in his study found that stretching and aerobic exercise alone proved to be much less effective than isometric training exercises.

- **According to Philadelphia Panel evidence** – based clinical practice guidelines, one controlled clinical trail found significant and clinically important patient global assessment with isometric exercises with a risk difference of 41% related to the untreated controlled group. The Philadelphia panel found good scientific evidence, which showed clinically important benefit on pain function with supervised isometric or slow neck movement exercises.
- According to **Rand S.Swenson** (2003) a controlled but nonrandomized clinical trail has investigated Exercise therapy neck pain. Based on this study, there is some evidence for use of Isometric neck exercises.

ENDURANCE EXERCISES

- **Anneli Peoisson** (2007) in his study shows that patients with impairment in neck muscle endurance (NME) before and after treatment suggest that additional exercise of specific training of NME should be in corporate into the rehabilitation program, which may improve treatment outcome.
- **Sovelius R, Oksa J, Rinpala H** et al (2006) concluded both strength and trampoline training were found to be effective in reducing muscle strain during in flight and cervical loading test, especially in the cervical muscles.

- **Ylinen J, Takala EP, Nykanen M, Hackney A,** et al (2003) compared controlled endurance exercise and isometric neck strength training with aerobic and stretch exercise for twelve month training. The results showed that improved flexion by 110°, rotation by 76%, and extension by 69% in strength training group. The respective improvements in the endurance training group were 28%, 29% and 16%. In controlled group were 10%, 10%, 7%.
- **Viljanen M** (2003) studied the outcome of dynamic exercise or relaxation treatment in nearly 400 finish female office workers who had chronic, non specific neck pain and the age group selected for the study was 30-60 years. Dynamic muscles training had greater improvement on chronic non specific neck pain.
- **Randlov A, Ostergaard M, Mannichec, Krygesp** (1998) compared the effectiveness of intensive and less intensive endurance training for three months on female (n-77), age 18-65 years suffering from neck and shoulder pain. They concluded that both subjective and objective improvements were seen patients suffering from chronic neck and shoulder pain in activities of daily living.

NECK DISABILITY INDEX

- **Pohjolainen T, Karppi SL, Airaksinen O,** et al (2003) assessed neck disability by Vernon's disability index and pain by visual analogue scale. They suggest that rehabilitation in cases of chronic neck pain should aim at raising tolerance to mechanical strain.
- **Vernon and Mior** found that Neck disability questionnaire is a reliable and valid questionnaire for assessing the disability of the patients with neck pain.

3. MATERIALS AND METHODOLOGY

3.1 MATERIALS

The study was designed to determine the efficacy of isometric neck muscle strengthening exercises to decrease pain and to increase range of motion in patients with mechanical pain in neck.

PARAMETERS

Pain- Visual Analog Scale (VAS)

Disability-Vernon neck Disability index .

3.2 SUBJECTS

Female patients between age group 25 to 50 years with Mechanical neck pain are taken. The patients were primarily diagnosed and evaluated by the physician. The patient who fulfill the inclusion criteria have taken for the study and informed consent was obtained from the patients.

3.3 MATERIALS USED

- Theraband
- High bucked wooden chair
- Goniometer
- Inch tape
- Couch

3.4 METHODOLOGY

Study Design

The study was conducted with two groups- comparative study.

Study Setting

The study was conducted in the department of physiotherapy, Sri Ramakrishna hospital, Coimbatore.

Study Duration

The study was conducted for 6 months.

3.5 TREATMENT DURATION

Both groups received treatment for 4 weeks, daily 2 sessions per day with 10 repetitions per session.

Sampling

Mechanical neck pain patients or included in this study, according to inclusion criteria hence this will be a convenient sampling.

Group A : Strengthening exercises to neck muscles

Group B : Endurance training to neck muscle

3.6 STATISTICAL ANALYSIS

Independent ’t’ test.

3.7 CRITERIA FOR SAMPLE SECTION

Inclusion Criteria

- Idiopathic
- Subjects between the age groups of 25-50 yrs.
- Subjects suffering from mechanical neck pain more than three months.
- Localized pain in neck.

Exclusion Criteria

- Previous neck surgery.
- A history of malignancy.
- Fracture of cervical spine.
- Traumatic injury around cervical spine.
- Patients with Rheumatoid Arthritis.
- Chronic tension type head ache.
- Severe physical disease.
- Patients treated with anti-depressive and anti-inflammatory drugs.
- Disk prolapse.
- Cervical rib.
- Frequent Migraine
- Cervical spondylosis
- Peripheral nerve entrapment
- Sternocleidomastoid tightness

3.8 STATISTICAL TOOLS

Independent ‘t’ test was used to show the effectiveness of treatment between group 1 and group 2.

The 't' value was calculated using the formula.

$$t = \frac{\overline{X_1} - \overline{X_2}}{S} \sqrt{\frac{n_1 \ n_2}{n_1 + n_2}}$$

$$S = \sqrt{\frac{\sum \left(X_1 - \overline{X_1}\right)^2 + \sum \left(X_2 - \overline{X_2}\right)^2}{n_1 + n_2 - 2}}$$

X_1 = Difference between pretest and posttest values of Group A

X_2 = Difference between pretest and posttest values of Group B

$\overline{X_1}$ = Mean difference of Group A

$\overline{X_2}$ = Mean difference of Group B

n_1 = No. of samples in Group A

n_2 = No. of samples in Group B

S = Combined standard deviation

4. TREATMENT AND TECHNIQUES

GROUP A

a) ISOMETRIC EXERCISE FOR NECK FLEXORS

Procedures :

With one or two hands press with firm pressure into your forehead.

Do not let your head move,

Repeat **:** 10 times

Hold time **:** 5 sec.

Sessions **:** Twice/ day.

b) ISOMETRIC EXERCISE FOR NECK EXTENSORS

Procedure :

With one or both hands apply pressure on the back of your head.

Attempt to push your head forward but do not let your head move.

Repeat **:** 10 times
Hold time **:** 5 Sec
Sessions **:** Twice/day

c) ISOMETRIC EXERCISE FOR NECK LATERAL FLEXORS

Procedure :

With your right hand press with firm pressure on the right side of your head.

But do not let your head moves.

Repeat **:** 10 times

Hold time **:** 5 Sec

Session **:** Twice/day

d) ISOMETRIC EXERCISE FOR NECK ROTATION

Procedure :

With your right hand press with firm pressure on the right side of your.

But do not let your head move.

Repeat **:** 10 times

Hold time **:** 5 sec

Session **:** Twice/day

ISOMETRIC NECK STRENGTHENING EXERCISE USING THERABAND

a) Cervical flexors strengthening

The theraband is attached to one end behind the patient's head and looped around.

Keep the neck and back straight.

In sitting

Move the head 10 cm forward

Hold and slowly return to starting position.

In standing

Move one step forward

Hold and slowly to starting position

b) Cervical extensors strengthening

The theraband is attached to end in front of the patient's head and looped around.

Keep the back and neck straight.

In sitting

Move the head 10 cm backward.

Hold and slowly return to starting position

In standing

Move one step backward

Hold and slowly return to the starting position.

c) Cervical lateral flexors strengthening

The theraband is attached to one side of patient's head and looped around.

In sitting

Slightly lean to the side from hips, moving the head towards one side.

Hold and slowly return to the starting position.

In standing

Step to the side.

Hold and slowly return to the starting position.

ISOMETRIC LATERAL FLEXION WITH SIDE STEPPING

d) Cervical rotators strengthening

Place the middle of the band around the back of patient's head.

Cross the ends of the band over forehead and grasp the ends of the band at eye level near the hand.

Neck is in neutral position with chin slightly tucked.

Extend the elbow outward to the side.

Stretching the band away from the head slowly return and keep neck stable.

Repeat with other hand.

GROUP B

ENDURANCE TRAINING FOR NECK FLEXORS

Procedure

In supine position lifting the head.

Repeat : 10 times

Hold time : 5 seconds

Sessions : Twice/day

ENDURANCE TRAINING FOR NECK EXTENSORS

Procedure

In prone position lifting the head

Repeat : 10 times

Hold time : 5 seconds

Sessions : Twice/day

ENDURANCE TRAINING FOR NECK LATERAL FLEXORS

In side lying lifting the head

Repeat : 10 times

Hold time : 5 seconds

Sessions : Twice/day

DO's

Use an orthopaedic pillow if you normally sleep with more than one pillow.

Adjust the desk, chair and computer or the monitor at the eye level.

During sneezing and coughing keep the neck straight holding with hand to prevent excessive jerk.

Take frequent breaks, when driving long distance or working long hours.

DONT's

Avoid tucking the phone between ear and shoulder, use headset.

Do not carry weight with one hand carry with both hand.

Avoid sleeping on the stomach, choose a pillow that support natural curves.

Do not sit without back support armrest and backrest should be provided.

5. DATA ANALYSIS AND INTERPRETATION

VISUAL ANALOG SCALE FOR GROUP A

S.No.	Pretest	Post test	X_1	$X_1 - \overline{X}_1$	$\left(X_1 - \overline{X}_1\right)^2$
1	7	4	3	-0.1	0.01
2	5	2	3	-0.1	0.01
3	8	5	3	-0.1	0.01
4	6	3	3	-0.1	0.01
5	7	4	3	-0.1	0.01
6	5	3	2	-1.1	1.21
7	6	2	4	0.9	0.81
8	7	5	2	-1.1	1.21
9	8	4	4	0.9	0.81
10	5	2	3	-0.1	0.01
11	7	3	4	0.9	0.81
12	6	3	3	-0.1	0.01
13	8	5	3	-0.1	0.01
14	5	2	3	-0.1	0.01
15	6	3	3	-0.1	0.01

Mean : 3.06

VISUAL ANALOG SCALE FOR GROUP B

S.No.	Pretest	Post test	X_2	$X_2 - \overline{X}_2$	$\left(X_2 - \overline{X}_2\right)^2$
1	8	6	2	-0.3	0.09
2	6	4	2	-0.3	0.09
3	5	2	3	0.7	0.49
4	8	5	3	0.7	0.49
5	6	3	3	0.7	0.49
6	7	5	2	-0.3	0.09
7	5	3	2	-0.3	0.09
8	5	2	3	0.7	0.49
9	7	6	1	-1.3	1.69
10	6	3	3	0.7	0.49
11	8	6	2	-0.3	0.09
12	7	5	2	-0.3	0.09
13	7	4	3	0.7	0.49
14	5	3	2	-0.3	0.09
15	6	4	2	-0.3	0.09

Mean :2.3
SD = 0.612
t =3.87

VISUAL ANALOG SCALE FOR GROUP A

VISUAL ANALOG SCALE FOR GROUP B

NECK DISABILITY INDEX SCALE FOR GROUP A

S.No.	Pretest	Post test	X_1	$X_1 - \overline{X}_1$	$\left(X_1 - \overline{X}_1\right)^2$
1	35	20	15	-1.7	2.89
2	28	13	15	-1.7	2.89
3	30	16	14	-2.7	7.29
4	35	18	17	0.3	0.09
5	37	21	16	-0.7	0.49
6	38	22	16	-0.7	0.49
7	44	23	21	4.3	18.49
8	40	22	18	1.3	1.69
9	32	15	17	0.3	0.09
10	46	25	21	4.3	18.49
11	38	20	18	1.3	1.69
12	35	22	13	-3.7	13.69
13	30	18	12	-4.7	22.09
14	46	25	21	4.3	18.49
15	30	14	16	-0.7	0.49

Mean : 16.6

NECK DISABILITY INDEX SCALE FOR Group B

S.No.	Pretest	Post test	X_2	$X_2 - \overline{X}_2$	$\left(X_2 - \overline{X}_2\right)^2$
1	33	18	15	0.8	0.64
2	40	24	16	1.8	3.24
3	27	15	12	-2.2	4.84
4	25	17	8	-6.2	38.44
5	42	24	18	3.8	14.44
6	35	20	15	0.8	0.64
7	37	22	15	0.8	0.64
8	31	19	12	-2.2	4.84
9	28	16	12	-2.2	4.84
10	42	24	18	3.8	14.44
11	37	20	17	2.8	7.84
12	35	22	13	-1.2	1.44
13	28	15	13	-1.2	1.44
14	27	15	12	-2.2	4.84
15	42	25	17	2.8	7.84

Mean : 14.2
SD = 2.8
t = 2.32

NECK DISABILITY INDEX SCALE FOR GROUP A

NECK DISABILITY INDEX SCALE FOR GROUP B

MEAN DIFFERENCE BETWEEN

GROUP A AND GROUP B VISUAL ANALOG SCALE

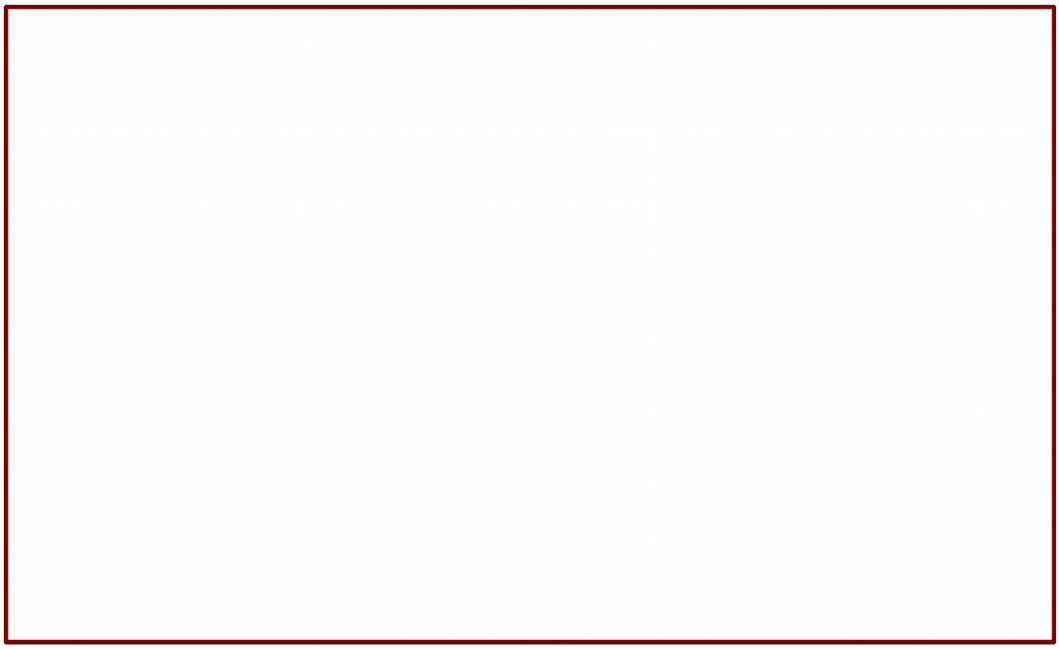
AND NECK DISABILITY INDEX

	Group A	Group B	SD	**Calculated 't' value**	Table 't' value
VAS	3.1	2.33	0.612	3.87	2.048
NDI	16.66	14.2	2.8	2.32	

MEAN DIFFERENCE BETWEEN

GROUP A AND GROUP B VISUAL ANALOG SCALE

AND NECK DISABILITY INDEX



6. DISCUSSION

- Mechanical neck pain is one of the most common problems faced by several individuals.
- As Mechanical neck pain is a major problem in the society, it is necessary to isometric neck muscles strengthening exercises and endurance training which will reduce pain and improve functional ability, so that the individual can lead a better sedentary life.
- So our study aimed at reducing pain and improving range of motion in these patients by emphasizing isometric neck muscles strengthening exercises and endurance training.

The calculated 't' value for the visual Analogue scale and Vernon neck disability index are 3.87 and 2.3 respectively, which is greater than the table 't' value of 2.048 at 28° of freedom at 0.05 level of significance.

7. CONCLUSION

- The study was done to find out optimal treatment strategy for Mechanical neck pain.
- Isometric neck muscle strengthening exercises and endurance training is a useful preventive approach for mechanical neck pain.
- Based on statistical analysis, it is clear that treatment protocol using Isometric neck muscle strengthening exercises (using thera-band) is significantly more effective.
- Hence the null hypothesis is rejected and alternate hypothesis is accepted stating that.

  "There is significant difference in the symptomatic recovery on using Isometric neck muscle strengthening exercises in patients with mechanical neck pain".

LIMITATIONS OF THE STUDY

- The study was conducted with a small sample of 30 patients only.
- Patients with localized pain were only taken for sampling.
- Shoulder girdle and shoulder functions are not included in this study.
- Acute stage of the conditions was not studied.
- Patients who are office workers were only selected.

SCOPE FOR FURTHER STUDY

- The study can be done with more number of patients with long term follow up to analyze the recurrence rate.
- Other electrotherapy modalities can also be used along with isometric neck exercises.

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APPENDICES

APPENDIX - I

ORTHOPAEDIC ASSESSMENT

BASIC EVALUATION CHART

Name:

Age:

Sex:

Occupation:

Address:

Height:

Weight:

Date of assessment:

IP/OP number:

Chief Complaints:

Vital Signs

- Temperature (T°)

- Heart Rate (pulses/min)

- Respiratory rate (breaths/min)

- Blood pressure (mm/Hg)

History

- Past Medical History
- Present Medical History
- Surgical History
- Occupational History
- Drug History

Pain Assessment

- Type of pain
- Nature of pain
- Duration
- Aggravating factors
- Relieving factors
- Visual Analog Scales

On observation

- Built of patient
- Posture
- Deformity
- Gait
- External appliances

On palpation

- Inflammatory signs

  Warmth and tenderness

- Muscle tone

- Muscle spasm

On examination

- Range of motion

Movement	**Active ROM**	**Passive ROM**	**Painful ROM**	**Pain free ROM**
Flexion				
Extension				
Side flexion				
Rotation				

- ADL activities

- Problem list

Treatment

- Aims

- Means

- Home Programmes

APPENDIX - II

FOLLOW UP CHART

Patient name

Age

Sex

Occupation

Address

IP/OP No.

Condition :

Chart

Parameters	Pre test	I week	II week	III week	IV Week Post test
NDI					
VAS					

APPENDIX – III

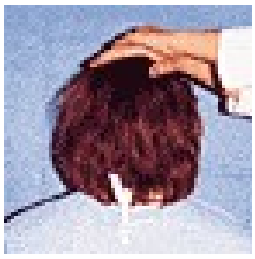
Mechanical Neck Pain

Spurling Test

Arm abduction sign is positive if pain is relieved with the upper extremity in this position.

A positive Spurling's test is the creation of upper extremity pain by extending the neck and rotating the chin toward the affected extremity (Figure 8). The axial compression test reproduces pain when pressure is applied to the top of the patient's head; alternatively, relief of symptoms occurs when traction is applied under the chin and occiput (Figure 9). The finger escape sign is performed by asking the patient to hold his/her fingers in extension. The test is positive if the ring and small fingers gradually flex and abduct (Figure 10). The patient should further be observed for the ability to rapidly open and close his/her hands.

Compression test



Compression test is performed by pressing on the top of the patient's head with her neck in a neutral position. The test is positive if the pain is exacerbated.

Distraction Test

Traction is applied by the examiner by placing her hands under the chin and occiput. The test is positive if the patient's pain is decreased.

NECK DISABILITY INDEX

Functional disability can be measured using the neck disability index (NDI) score which is a functional index comprising of 10 items in the form of activities of daily living with each item scoring from 0-5 where o is no difficulty in performing that activity and 5 is inability to do that activity. The total scores are given out of 50, where 0-4 : no disability, 5-14 : mild disability, 15-24; moderate disability. 25-34 severe disability and more than 35 : complete disability. Scoring for all the 10 items is done by asking the subject to mask his/her ability to perform each of the ten activities. The NDI has been found to have a high degree of reliability and internal consistency as compared to other sickness impact profiles in various conditions of neck pain.

NECK DISABILITY INDEX

Name :_____ Date _____ Patient_____

This questionnaire is designed to enable us to understand how much your neck pain has affected your ability to manage in everyday life. Please answer every section and mark in each section only the one circle, which applies to you. We realize you may consider that two of the statements in any section may relate to you, but please just mark the circle, which most closely described your probe.

Section 1 : Pain intensity

- ❖ I have no pain at the movement
- ❖ The pain is very mild at the movement
- ❖ The pain is moderate at the movement
- ❖ The pain is fairly severe at the movement
- ❖ The pain is very severe at the movement
- ❖ The pain is the worst imaginable at the movement

Section 2 – Personal care

- ❖ I can look after myself normally without causing extra pain .
- ❖ I cannot look after myself normally but it causes extra pain.

- It is painful to look after myself and I am slow and careful.
- I need some help but manage most of my personal care.
- I need help everyday in most aspects of self care.
- I do not get dressed ; I wash with difficulty and stay in bed .

Section – 3 : Lifting (skip if you have not attempted lifting since the onset of your neck pain)

- I can lift heavy weights without extra pain.
- I can lift heavy weights but it gives extra pain.
- Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned e.g. on a table.
- Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.
- I can only very lightweights
- I cannot lift or carry anything at all.

Section 4 – Reading

- I can read as much as I want to with no pain in my neck.

- I can read as much as I want to with slight pain in my neck.
- I can read as much as I want with moderate pain in my neck.
- I cannot read as much as I want because of moderate pain in my neck.
- I can hardly read at all because of severe pain in my neck.
- I cannot read at all.

Section 5 : Headaches

- I have no headaches at all.
- I have slight headaches, which come frequently.
- I have moderate headaches, which come infrequently.
- I have moderate headaches, which come frequently.
- I have severe headaches, which come frequently.
- I have headaches at all times.

Section 6 : Concentration

- I can concentrate fully when I want to with no difficulty.
- I can concentrate fully when I want to with no slight difficulty.
- I have a fair degree of difficulty in concentrating when I want to

- I have a lot of difficulty in concentrating when I want to
- I have a great deal of difficulty in concentrating when I want to
- I cannot concentrate at all.

Section 7 : Work

- I can do as much as I want to
- I can only do my usual work, but no more
- I can do most of my usual work, but no more
- I cannot do my usual work
- I can hardly do any work at all
- I cannot do any work at all

Section 8 : Driving

- I can drive may car without any neck pain
- I can drive may car as long s I want with slight neck pain.
- I can drive may car as long as I want with moderate neck pain
- I can drive may car as long as I want because of neck pain
- I can hardly drive at all because of severe neck pain
- I cannot drive may car at all

Section 9 : Sleeping

- I have no trouble sleeping
- My sleep is slightly disturbed (less than 1 hr of sleep loss)
- My sleep is mildly disturbed (1-2 hrs. of sleep loss)
- My sleep is moderately disturbed (2-3 hrs. of sleep loss)
- My sleep is greatly disturbed (3-5 hrs. of sleep loss)
- My sleep is completely disturbed (5-7 hrs. of sleep loss)

Section 10 : Recreation

- I am able to engage in all my recreation activities with no neck pain.
- I am able to engage in all my recreation activities, with some neck pain.
- I am able to engage in most, but not all of my recreation activities because of neck pain.
- I am able to engage in a few of my usual recreation activities because of neck pain.
- I can hardly do any recreation activities because of neck pain.
- I cannot do any recreation activities at all.

APPENDIX -IV

VISUAL ANALOGUE SCALE

The visual analogue scale used to determine the severity of pain experienced by the patients.

It is used to quantify the nature of pain. It attempts to represent measurement quantities in terms of straight line placed horizontally or vertically on a paper. The end points on the line are labeled descriptive terms of anchor the extremities of the scale commonly the line are 10cm in length.